Investigation of electrochemical behavior of Plasma nitrided Ti-6Al-7Nb alloy in Hanks' Solution

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Abstract

Titanium alloy Ti-6Al-7Nb was plasma nitrided using inductively coupled RF Plasma with 100% Nitrogen at 700, 750 and 800°C for 4 h. XRD and micro Raman studies show the formation of titanium nitrides. Potentiodynamic polarization studies in Hanks' solution show the corrosion resistance of the untreated samples to be better than the treated samples. Electrochemical Impedance Spectroscopy (EIS) studies show higher charge transfer resistance and lower double layer capacitance for the substrate compared to the nitrided samples. FESEM images of samples immersed in SBF show that growth of apatite is more and the size of deposits are larger on nitrided samples as compared to that on the untreated substrate. EDS results show a decrease in nitrogen content and increase in oxygen content after corrosion experiments. XPS spectra from the nitrided samples show the presence of nitride and oxy nitride on the surface. Nitrided samples immersed in Hanks' solution for one day show higher amount of calcium, phosphorous and oxygen in hydroxide form than the substrate.

Keywords: Titanium alloy, Plasma Nitriding, corrosion, EIS, XPS, apatite

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